

**REMARKS**

Claims 9-15 and 21-23 are pending in the application. This Amendment currently amends claims 9-12 and 15, and adds new claim 21-23. Claims 1-8, which are withdrawn from current consideration, and claims 16-20 are canceled without prejudice or disclaimer. No new matter is added to currently amended claims 9-12 and 15, or to new claims 21-23. Claims 9-12 and 15 are currently amended to merely clarify the subject matter of the claims and in no way narrow the scope of the claims in order to overcome the prior art or for any other statutory purpose of patentability.

Notwithstanding any claim amendments of the present Amendment or those amendments that may be made later during prosecution, Applicants' intent is to encompass equivalents of all claim elements. Reconsideration in view of the foregoing amendments and the following remarks is respectfully requested.

Claims 9 and 12 stand rejected under 35 U.S.C. §103(a) as unpatentable over U.S. Patent No. 6,114,051 to Nishimura et al.(hereinafter, Nishimura) in view of U.S. Patent No. 6,342,734 B1 to Allman et al. (hereinafter, Allman) and U.S. Patent No. 6,165,880) to Yuang et al. (hereinafter, Yuang). Claims 10, 13, and 14 stand rejected under 35 U.S.C. §103(a) as unpatentable over Nishimura in view of Allman and Yuang, and further in view of U.S. Patent Application No. 2003/0008467 A1 to Kai et al. (hereinafter, Kai). Claim 11 stands rejected under 35 U.S.C. §103(a) as unpatentable over Nishimura in view of Allman and Yuang, and further in view of U.S. Patent No. 5,891,799 to Tsui. Claim 15 stands rejected under 35 U.S.C. §103(a) as unpatentable over Nishimura in view of Allman and Yuang, and further in view of U.S. Patent No. 6,391,713 B1 to Hsue et al. (hereinafter, Hsue).

Claims 16 and 17 stand rejected under 35 U.S.C. §103(a) as unpatentable over Allman in view of Kai and Yuang. Claims 18 and 19 stand rejected under 35 U.S.C. §103(a) as unpatentable over Allman in view of Kai and Yuang and further in view of Nishimura. Claim 20 stands rejected under 35 U.S.C. §103(a) as unpatentable over Allman in view of Kai and Yuang and further in view of Hsue.

With respect to the rejections of claims 16-20, above, Applicants respectfully submit that claims 16-20 are canceled without prejudice or disclaimer; hence, the rejections of claims 16-20 are moot. Withdrawal of the rejections of 16 and 17 under 35 U.S.C. §103(a) over Allman in view of Kai and Yuang, of claims 18 and 19 under 35 U.S.C. §103(a) over Allman in view of Kai and Yuang and further in view of Nishimura, and of claim 20 under 35 U.S.C. §103(a) as unpatentable over Allman in view of Kai and Yuang and further in view of Hsue are respectfully solicited.

These rejections are respectfully traversed in view of the following discussion.

## **I. THE CLAIMED INVENTION**

The claimed invention, as defined in independent claim 9, is directed to a method of fabricating a multilayer semiconductor device that comprises forming an metal-insulator-metal (MIM) capacitor including a first metal plate, a dielectric layer formed on the first metal plate, and a second metal plate formed on the dielectric layer, patterning the second metal plate, depositing a nitride etch stop layer above the MIM capacitor, forming an interlayer dielectric on the nitride etch stop layer, forming a first via and a second via through at least the interlayer dielectric by an anisotropic etch process to contact the nitride etch stop layer above the patterned second metal plate and above the first metal plate, respectively, and removing portions of the nitride etch stop layer, where the first via and the second via contact the nitride etch stop layer.

An aspect of the present invention prevents degradation of the capacitor dielectric, which may be caused by excessive electrical charging and ion/plasma damage of the top and bottom plates of a metal-insulator-metal (MIM) capacitor during anisotropic etching, by depositing a nitride etch stop layer above at least the top metal plate and the bottom plate of the MIM capacitor.

Another aspect of the present invention prevents plate-to-plate electrical shorting of an MIM capacitor, which may be caused by either top plate etch-through or dielectric breakdown, associated with anisotropic etch processes above the level of the MIM capacitor, by by depositing a nitride etch stop layer above at least the top metal plate and the bottom plate of the MIM

capacitor.

## II. THE PRIOR ART REJECTIONS

### A. The Nishimura Reference

With respect to claim 9, the Examiner admits that Nishimura fails "to teach using the nitride layer as an etch stop layer; forming the first and second vias by an anisotropic etch process to contact the nitride layer; and removing portions of the nitride etch stop layer." (Please see, Office Action, page 3, lines 14-16).

### B. The Allman Reference

Allman discloses that an optional dielectric layer 47 may be deposited on top of the top plate 44 to provide an etch stop for the via etched in the process of forming the via interconnect 46 extending from the upper interconnect layer 24 to the top plate 44 of the capacitor 20 (col. 6, lines 41-45). The dielectric layer 47 will thereby prevent a portion of the top plate 44 from being etched away or degraded while the adjoining via continues to be etched through the IMD layer 26 to the top of the bottom plate 33 (col. 6, lines 48-52, and particularly, Figs. 1 and 4-6).

Claim 9 recites at least the features of "forming a first via and a second via through at least the interlayer dielectric by an anisotropic etch process to contact the nitride etch stop layer above the patterned second metal plate and above the first metal plate, respectively; and removing portions of the nitride etch stop layer, where the first via and the second via contact the nitride etch stop layer."

Figs. 1 and 4-6 of Allman clearly show that the optional dielectric layer 47, which allegedly corresponds to the claimed invention's nitride etch stop layer, provides an etch stop for the via extending to the top plate of the capacitor, does not extend over the bottom plate 33, which allegedly corresponds to the claimed invention's first metal plate, of the capacitor 20, and thus, does not provide an etch stop for the via extending to the top of the bottom plate 33.

Therefore, Allman fails to teach or suggest at least the features of "forming a first via and a second via through at least the interlayer dielectric by an anisotropic etch process to contact the

nitride etch stop layer above the patterned second metal plate and above the first metal plate, respectively; and removing portions of the nitride etch stop layer, where the first via and the second via contact the nitride etch stop layer," as recited in claim 9.

### **C. The Yuang Reference**

The Examiner admits that Nishimura and Allman fail to teach forming the first and second vias through at least the interlayer dielectric by an anisotropic etch process to contact the nitride etch stop layer (Office Action, page 4, lines 10-12). The Examiner then continues to state, "However, Yuang et al. (Figs. 1-3) in a related method to form interconnects using a nitride etch stop layer teach[es] forming a first (1) and second (1') via through an interlayer dielectric (22) by an anisotropic etch process to contact a nitride etch stop layer (20) (column 5, lines 16-53)." (Office Action, page 4, lines 12-15).

Yuang does not cure the deficiencies of Nishimura and Allman, as argued above with respect to the rejection of claim 9. Nowhere does Yuang teach or suggest forming first and a second vias through an interlayer dielectric by an anisotropic etch process to contact a nitride etch stop layer, which is disposed above a patterned second metal plate and above a first metal plate, respectively, of an MIM capacitor and removing portions of the nitride etch stop layer, where the first via and the second via contact the nitride etch stop layer as recited in claim 9.

For at least the reasons outlined above, Applicants respectfully submit that Nishimura, Allman and Yuang, either individually or in combination, fail to disclose every feature of claim 9. Accordingly, Nishimura, Allman and Yuang, either individually or in combination, fail to teach or suggest the subject matter of claim 9 and claim 12, which depends from claim 9, under 35 U.S.C. §103(a). Withdrawal of the rejection of claims 9 and 12 under 35 U.S.C. §103(a) as unpatentable over Nishimura in view of Allman and Yuang is respectfully solicited.

### **D. The Kai Reference**

With respect to claims 10, 13 and 14, the Examiner cites Figs. 5-11 of Kai for teaching patterning of a second metal plate (36) using an anisotropic etching process ([0045-0050])

(Office Action, page 5, lines 13-15).

Kai does not cure the deficiencies of Nishimura, Allman and Yuang, as argued above with respect to the rejection of claims 9 and 12 because nowhere does Kai teach or suggest forming first and a second vias through an interlayer dielectric by an anisotropic etch process to contact a nitride etch stop layer, which is disposed above a patterned second metal plate and above a first metal plate, respectively, of an MIM capacitor and removing portions of the nitride etch stop layer, where the first via and the second via contact the nitride etch stop layer as recited in claim 9.

For at least the reasons outlined above, Applicants respectfully submit that Nishimura, Allman, Yuang and Kai, either individually or in combination, fail to disclose every feature of claim 9. Accordingly, Nishimura, Allman, Yuang and Kai, either individually or in combination, fail to teach or suggest the subject matter of claim 9 and claims 10, 13 and 14, which depend from claim 9, under 35 U.S.C. §103(a). Withdrawal of the rejection of claims 10, 13 and 14 under 35 U.S.C. §103(a) as unpatentable over Nishimura, in view of Allman and Yuang, as applied to claims 9 and 12, and further in view of Kai is respectfully solicited.

#### **E. The Tsui Reference**

With respect to claim 11, the Examiner cites Fig. 6 of Tsui for teaching removing portions of a nitride layer (16) using  $C_4H_8$  (column 5, lines 20-65).

Tsui does not cure the deficiencies of Nishimura, Allman and Yuang, as argued above with respect to the rejection of claims 9 and 12 because nowhere does Tsui teach or suggest forming first and a second vias through an interlayer dielectric by an anisotropic etch process to contact a nitride etch stop layer, which is disposed above a patterned second metal plate and above a first metal plate, respectively, of an MIM capacitor and removing portions of the nitride etch stop layer, where the first via and the second via contact the nitride etch stop layer as recited in claim 9.

For at least the reasons outlined above, Applicants respectfully submit that Nishimura, Allman, Yuang and Tsui, either individually or in combination, fail to disclose every feature of

claim 9. Accordingly, Nishimura, Allman, Yuang and Tsui, either individually or in combination, fail to teach or suggest the subject matter of claim 9 and claim 11, which depends from claim 9, under 35 U.S.C. §103(a). Withdrawal of the rejection of claim 11 under 35 U.S.C. §103(a) as unpatentable over Nishimura, in view of Allman and Yuang, as applied to claims 9 and 12, and further in view of Tsui is respectfully solicited.

#### **F. The Hsue Reference**

With respect to claim 15, the Examiner cites Hsue for forming a second interlayer dielectric between the second metal plate and the nitride etch stop layer (Office Action, page 7, lines 7-8).

Hsue does not cure the deficiencies of Nishimura, Allman and Yuang, as argued above with respect to the rejection of claims 9 and 12 because nowhere does Hsue teach or suggest forming first and a second vias through an interlayer dielectric by an anisotropic etch process to contact a nitride etch stop layer, which is disposed above a patterned second metal plate and above a first metal plate, respectively, of an MIM capacitor and removing portions of the nitride etch stop layer, where the first via and the second via contact the nitride etch stop layer as recited in claim 9.

For at least the reasons outlined above, Applicants respectfully submit that Nishimura, Allman, Yuang and Hsue, either individually or in combination, fail to disclose every feature of claim 9. Accordingly, Nishimura, Allman, Yuang and Hsue, either individually or in combination, fail to teach or suggest the subject matter of claim 9 and claim 15, which depends from claim 9, under 35 U.S.C. §103(a). Withdrawal of the rejection of claim 15 under 35 U.S.C. §103(a) as unpatentable over Nishimura, in view of Allman and Yuang, as applied to claims 9 and 12, and further in view of Hsue is respectfully solicited.

### **III. INFORMAL MATTERS AND CONCLUSION**

Applicants respectfully submit that claims 9, 11, 12, and 15 are amended above, to substitute "etch stop" for "etchstop," to answer the Examiner's objections to the claims. This

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Amendment cancels claims 16-20 without prejudice or disclaimer; hence, the objection to claims 16-20 is moot.

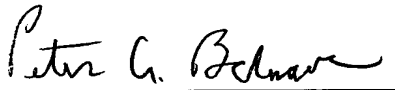
In view of the foregoing, Applicants submit that claims 9-15 and 21-23, all the claims presently pending in the application, are patentably distinct over the prior art of record and are in condition for allowance. The Examiner is respectfully requested to pass the above application to issue at the earliest possible time.

Should the Examiner find the application to be other than in condition for allowance, the Examiner is requested to contact the undersigned at the local telephone number listed below to discuss any other changes deemed necessary in a telephonic or personal interview.

The Commissioner is hereby authorized to charge any deficiency in fees or to credit any overpayment in fees to Attorney's Deposit Account No. 50-0481.

Respectfully Submitted,

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